CLAIMS

1. A fuel cell system, comprising:

a fuel cell stack (1) configured to provide electric power or electric current;

a cooling unit (3, 4) configured to cool the fuel cell stack (1) by flowing a coolant through a coolant passage (2) provided in the fuel cell stack (1);

an inlet temperature detecting unit (5) configured to detect the temperature of the coolant at the inlet of the fuel cell stack (1); and

a control unit (21) configured to control the electric power or electric current extracted from the fuel cell stack (1) in accordance with the coolant temperature detected by the inlet temperature detecting unit (5).

2. The fuel cell system of claim 1, wherein

the control unit (21) sets the limit value of the electric power or electric current extracted from the fuel cell stack (1) in such a manner that the higher said coolant temperature becomes, the lower said limit value is set.

3. The fuel cell system of claim 2, wherein

the control unit (21) sets said limit value to a fixed value until the coolant temperature reaches a prescribed temperature and lowers the limit value when the coolant temperature exceeds the prescribed temperature.

4. The fuel cell system of claim 3, wherein

when said coolant temperature exceeds the prescribed value, the control unit (21) sets said limit value in such a manner that the extracted current becomes lower as said coolant temperature becomes higher.

5. The fuel cell system of claim 1, wherein the control unit (21) performs the following processes:

receives the coolant temperature detected by the inlet temperature detecting unit (5);

obtains a maximum electric current allowed to be extracted from the fuel cell stack (1) based on said coolant temperature;

compares a requested electric current to the maximum current allowed to be extracted; and

selects the smaller of the compared electric currents.

6. The fuel cell system of claim 1, wherein the control unit (21) performs the following processes:

receives the coolant temperature detected by the inlet temperature detecting unit (5);

calculates an allowable value for the coolant temperature difference between the inlet and outlet of the fuel cell stack (1) based on said coolant temperature;

estimates the coolant temperature difference between the inlet and outlet of the fuel cell stack based the allowable value for the coolant temperature difference between the inlet and outlet of the fuel cell stack (1);

obtains a maximum electric current allowed to be extracted from the fuel cell stack (1) based on the coolant temperature difference between the inlet and outlet of the fuel cell stack (1);

compares a requested electric current to the maximum current allowed to be extracted; and

selects the smaller of the compared electric currents.

7. The fuel system of claim 1, further comprising:

an outlet temperature estimating unit (21) configured to estimate the temperature of the coolant at the outlet of the fuel cell stack (1); wherein

a control unit (21) controls the electric power or electric current extracted from the fuel cell stack (1) in accordance with the temperature of the coolant at

the outlet of the fuel cell stack (1) estimated by the outlet temperature estimating unit (21).

8. The fuel cell system of claim 7, further comprising:

a coolant flow rate detecting unit (19) configured to detect the flow rate of the coolant either directly or indirectly; and

a heat removal rate estimating unit (21) configured to estimate the rate at which heat is transferred from the fuel cell stack (1) to the coolant.

9. The fuel cell system of claim 8, wherein

the outlet temperature estimating unit (21) estimates the coolant temperature at the outlet of the fuel cell stack (1) based on the coolant flow rate detected by the coolant flow rate detecting unit (19) and the heat removal rate estimated by the heat removal rate estimating unit (21).

10. The fuel cell system of claim 9, wherein

the heat removal rate estimating unit (21) estimates the heat removal rate based on the electric power or electric current extracted from the fuel cell stack (1).

11. The fuel cell system of claim 9, wherein

the heat removal rate estimating unit (21) estimates the heat removal rate based on the electric power or electric current extracted from the fuel cell stack (1) and the output voltage of the fuel cell stack (1).

12. The fuel cell system of claim 10, further comprising:

a stack temperature detecting unit (20) configured to detect the temperature of the fuel cell stack either directly or indirectly.

13. The fuel cell system of claim 12, wherein

the heat removal rate estimating unit (21) estimates the heat removal rate based on the electric power or electric current extracted from the fuel cell stack (1) and the temperature of the fuel cell stack (1) detected by the stack temperature detecting unit (20).

14. The fuel cell system of claim 7, further comprising:

a coolant flow rate setting unit (21) configured to set the flow rate of the coolant in such a manner that, at least in a high load region of the fuel cell, the difference between the coolant temperature at the inlet of the fuel cell stack and the estimated coolant temperature at the outlet of the fuel cell stack increases as the output of the fuel cell increases.

15. The fuel cell system of claim 7, further comprising:

an outlet temperature detecting unit (20) configured to detect the temperature of the coolant at the outlet of the fuel cell stack (1).

16. The fuel cell system of claim 15, wherein

the control unit (21) limits the electric power or electric current extracted from the fuel cell stack (1) when the temperature detected by the outlet temperature detecting unit (20) exceeds a prescribed value.

17. The fuel cell system of claim 16, wherein

when the coolant temperature is rising, the control unit (21) sets said prescribed value in such a manner that the electric power or electric current extracted from the fuel cell stack (1) is limited based on the temperature of the coolant at the inlet of the fuel cell stack (1) before it is limited based on the temperature of the coolant at the outlet of the fuel cell stack (1) while the coolant temperature rises.